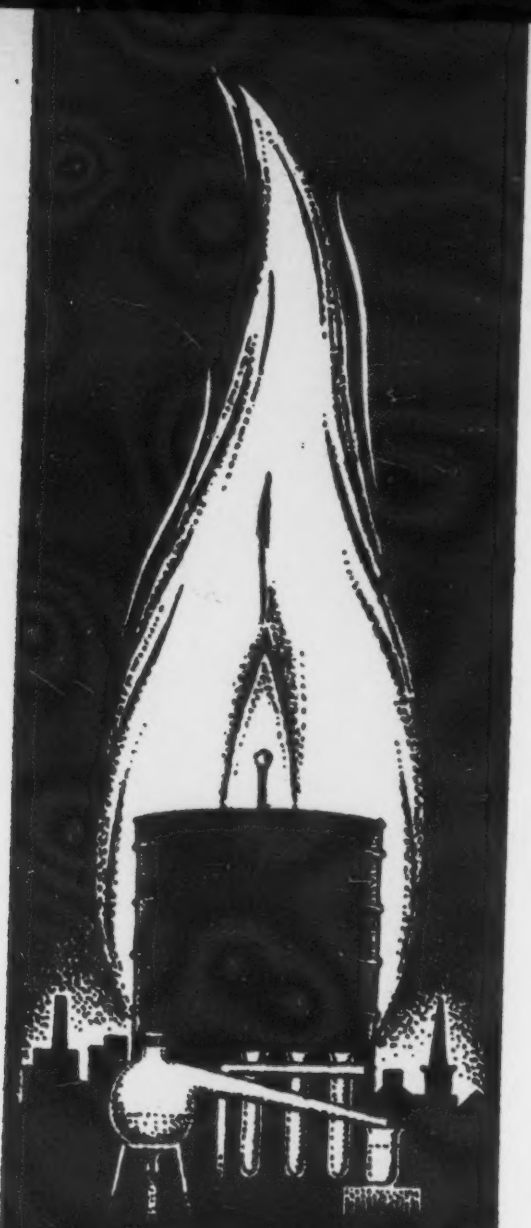

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GAS ABSTRACTS

GAS ABSTRACTS was started in 1945 by the Institute of Gas Technology to survey current technical journals, to select articles pertaining to the Gas industry, and to prepare abstracts of these articles, stressing their significance to the Gas industry.

Selection of Articles: Each month the periodicals listed on the last two pages are examined and articles pertaining to the production or manufacture, distribution, transmission or storage, and utilization of natural and manufactured gas and related subjects are selected for abstracting by individual staff members of the Institute of Gas Technology. When possible the significance of the article to the Gas industry is stressed.

Classification of Abstracts: The abstracts are grouped under twelve headings for presentation and are arranged alphabetically by subject in each group. The headings and subject matter included in each are presented below:

1. The Gas Industry will include general information and news items, statistics, business regulations and other articles of general interest.

2. Appliances - Domestic and Commercial will include burners, ranges, cooking equipment, air conditioning equipment, water heaters and other gas appliances for domestic and commercial use.

3. Combustion and Industrial Furnaces will include combustion of gaseous, liquid and solid fuels; design of industrial furnaces; control of furnace atmospheres.

4. Carbonization and Gasification will include manufacture and purification of producer gas, blue gas, carburetted water gas, synthesis gas; carbonization and gasification of coal; and gasification of oil.

5. Natural Gas and Natural Gas Condensates will include production, transmission, distribution and storage of natural gas and natural gas condensates; distribution of LP-gas mixtures; carbon black and chemicals from natural gas and natural gas condensates.

6. Petroleum and Synthetic Liquid Fuels will include production, refining-cracking, alkylation, isomerization, and utilization of petroleum and production of synthetic liquid fuels by the Fischer-Tropsch reaction and hydrogenation.

7. Analytical Methods and Tests will include new and improved methods pertaining to gas making materials, processes, products, and by-products.

8. General and Physical Chemistry will include data on chemical and physical properties of elements and inorganic compounds; new reactions; and methods for carrying out established reactions.

9. Organic Chemistry will include data on organic compounds closely related to the Gas Industry; new reactions; new methods for carrying out established reactions.

10. Chemical Engineering will include data and methods for fluid flow, heat transfer, and unit operations of distillation, evaporation, extractive drying, and filtration.

11. Process Equipment and Instrumentation will include information on new equipment for process operations and process control.

12. Materials of Construction will include new developments in refractories, heat and corrosion resistant materials, new alloys applicable to the Gas Industry, and other materials of construction.

13. New Books will include recent books pertaining to the field of gas technology.

Annual Index: Author and subject indexes will be issued at the end of the year.

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98°, 134°, and 152°F *should read* 980°, 1340°, 1520°F.

Volume 2, No.7
Pages should be numbered **145 through 163.**

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CARBON BLACK PRODUCTION

CARBON BLACK PRODUCTION DURING 1945 SETS RECORD. *Oil & Gas J.* 45, *128 (1946) June 29.*

Production and sales of carbon black totaled 1,052,798,000 lb. from 58 plants during 1945, up 31% over 1944, according to the Bureau of Mines. Total gas consumed in the manufacture of the carbon black set a new record of 431,830,000,000 cu. ft., a 21% increase over 1944. Production of carbon black in 1945 was boosted by the completion of several new plants. The production of contact-process blacks, which declined from 1940 through 1943, gained 30% over 1944, to 538,539,000 lb. Furnace-black output continued its upward trend, increasing 33%, to 514,259,000 lb. in 1945, or 49% of total production. Texas' plants produced 69% of the U.S. total.

--Excerpt from article

MIDWEST NATURAL GAS FACILITIES

$20,439,675 PROJECT APPROVED BY FPC TO INCREASE NATURAL GAS FACILITIES SERVING MIDWEST AREA. *Natural Gases* 1, *11-12 (1946) July.*

The Federal Power Commission has announced its order and opinion authorizing (1) Natural Gas Pipe Line Co. of America and Texoma Natural Gas Co. to construct facilities to increase Natural's sales capacity by 85,000 m.c.f. daily, (2) Natural to sell and deliver natural gas to distributing utilities in Illinois and Iowa to serve markets now served with mixed or manufactured gas, and (3) Chicago District Pipe Line Co. to make additions to its present pipe line system to receive increased volumes of natural gas from Natural for delivery to customer utility companies which distribute gas in the Chicago metropolitan area. The aggregate cost of the proposed construction is estimated at $20,439,675.

--Excerpt from article

NATURAL GAS RESERVES

Dahlgren, E.G. THE PANHANDLE FIELD. THE WORLD'S LARGEST NATURAL GAS RESERVE. *Gas* 22, *44-51 (1946) July.*

The Panhandle Oil and Gas Field, largest in the world from the standpoint of original reserves, is composed of almost 1.6 million acres with reserves estimated in January at 19.3 trillion cu.ft. In Moore County, Texas, alone 619 gas wells are producing on an area of 543,086 acres with a potential of 18,484 MMcf per day.

--Editor's abstract

NATURAL GAS RESERVES

Olcott, P. RESERVES AND PRODUCTION OF NATURAL GAS AND NATURAL GAS LIQUIDS IN TEXAS. *Oil & Gas J.* 45, *72-75 (1946) July 13.*

The natural gas reserves and contained liquid in Texas have been divided into three categories: (1) Non-associated gas or free gas not associated with oil in the reservoir; (2) associated gas which is gas overlying an oil reservoir as a gas cap; and (3) dissolved gas or the gas in solution in the oil in the reservoir which is released when the oil is produced. The nonassociated gas and the associated gas together make up what is

generally called free gas, and the part of the associated gas produced with oil and the dissolved gas is called casinghead gas. These three categories were established because of the current conservation practices and the Railroad Commission regulations. The nonassociated gas represents about 69 per cent of the total gas reserves. This is the gas produced from gas wells in Texas, and in general the only restriction is that the production must be marketed and the allowable cannot exceed 25 per cent of the open flow potential. This nonassociated gas is the gas generally produced through cycling plants or into gas pipe lines for fuel. The associated gas, representing about 22 per cent of the total gas reserve, is restricted to cycling operations and the quantities produced with oil as casinghead gas. The dissolved gas designation is the same as has been used for years and represents the gas liberated from solution in the oil as it is produced. This is the remaining 9 per cent of the gas and is generally produced through natural-gasoline plants when the volume and yields are sufficient to warrant the construction of a plant. In fields where there are no plants, the dissolved gas is either used for fuel, compressed and put into gas pipe lines, used for repressuring or gas lift, or flared. It should be kept in mind that there is no material physical difference between these three gases. The history of the gas discoveries in Texas has been one of ever-increasing volume. Accompanying tables show these discoveries and the relationship between the three categories. In these tables the total reserves of each field are credited to the year in which the field was discovered.

--Excerpt from article

IMMERSION HEATING

Buck, R.M. GAS-FIRED IMMERSION HEATING. *Iron Age* 158, 46-52 (1946) July 11.

Essential engineering data for calculating size of immersion coil and burner input required for gas-fired immersion heating of liquids are given in this article. The author has correlated information not previously available at one source and has supplemented this with additional original material to make available all essential information necessary for determining coil and burner requirements. This information is applicable for pickling, plating and rinsing, solvent cleaning, waxes, soft metal, heat treating salts, etc.

4. CARBONIZATION AND GASIFICATION

CARBONIZATION

INCREASED YIELDS FROM COKE IN RUSSIA. *Chem. Met. Eng.* 53, 198, 200 (1946) *June.* Digest of paper by A. Agroskine in Compt. rend. de l'Academie des Sciences de l'URSS 42, No. 4, Nov. 10, 1945.

Coke plants at Magnitogorsk, Kuznetsk, and elsewhere in Russia have for the past three years been using a method of washing coal with gasoline which provides increased yields of coke and also has a favorable effect on the tar. Anthracenic oil has also been used as a wash. Much of the technique used is similar to comparable developments in the U.S. According to Russian scientists, the chief results so far have been: 1. Increased production of coke ovens generally runs not less than 5% if the charge is moistened with gasoline, and not less than 4% if anthracenic oil is used. 2. The increased weight of the charge from the wetting improves the quality of tars by diminishing cracking. 3. The quality of metallurgical coke is improved. 4. The technique can be rapidly and easily installed in any sort of coke plant. It can be used with all sorts of coal and different degrees of humidity. 5. The technique simplifies charging of coke ovens. Also the washed coal generally does not freeze in winter.

--Excerpt from article

COAL-OIL SUSPENSIONS, VISCOSITY

Kustov, V.F. and Khotuntzev, L.L. VISCOSITY OF COAL-FUEL OIL SUSPENSIONS. *Petroleum* 9, 134-135 (1946) *June.*

Experimental data have been obtained showing the effect of various factors on the viscosity of coal-fuel oil suspensions, with a viscometer of the capillary type, using tubes 100 cm. long and 0.4-0.8 cm. in diameter. The diminution of the viscosity of coal-oil suspensions, with rise of temperature, according to a set curve, had already been confirmed by previous laboratory experiments. The viscosity-temperature coefficients of suspensions that have been measured follow closely the change in viscosity temperature coefficient of the dispersing medium-i.e., the fuel oil. The marked increase of viscosity with rising concentration of the disperse phase, which had also been previously observed, was confirmed, likewise the high viscosity of charcoal suspensions. The decrease of viscosity of coal-oil suspensions with increasing fineness of the charcoal powder has been established. There has been likewise established the increased viscosity of suspensions containing charcoal powder, due to the increased specific area of this latter. The increase in the viscosity of coal-oil suspensions, corresponding to an increase in the viscosity of the fuel oil, has been confirmed. It has been found that the effect of slip on the flow of coal-oil suspensions through glass and iron tubes is the same. It is shown that increased homogenization of coal oil suspensions decreases their viscosity and hence increases their fluidity.

5. NATURAL GAS AND NATURAL GAS CONDENSATES

CORROSION PREVENTION

Senatoroff, N.K. CATHODIC PROTECTION. *Gas* 22, 41-43 *(1946) July.*

What either cathodic protection or pipe line wrapping alone might fail to accomplish in protecting a pipe line from corrosion, a combination of both might do. This, the author's thesis, is exemplified in a report on the experience of the Southern Counties Gas Co. of California in trying to defeat corrosion in a 26-in. high pressure natural gas transmission line in San Joaquin County. In 1941, the line, then ten years old, was leaking to such an extent that a study was undertaken to find a means of reducing repair costs sufficiently to keep the line in operation for several more years. Drainage stations were decided upon as an experiment, and the first one was installed in October of that year, with the second being erected in January, 1943. Studies were made of the results, which were found not to be up to expectations, because the electrolytic damage to the line prior to the installation of cathodic protection had been so extensive that there existed numerous pits in the pipe which had actually perforated the pipe wall. So reconditioning of the pipe was tried, with considerable emphasis being placed upon the thickness of the protective material used. The results to date are reported in this article, which was prepared for presentation at the Pacific Coast Gas Association Transmission Conference, by Mr. Senatoroff, a chemical engineer.

--Editor's abstract

GAS DEHYDRATION

NEW GLYCOL DEHYDRATION PLANT REDUCES GAS DEW POINT 50°. *Natl. Petroleum News* 38, *R-421-439 (1946) June 5.*

The Agua Dulce Dehydration Plant of the Tennessee Gas and Transmission Company has installed three contactors which can handle 300 mmcf/day of gas at 840 psig and reduce the dew point from about 80°F to about 30°F. The units are in parallel and use diethylene glycol as the dehydrating agent. Details of construction and operation are presented.

--J.D. Parent

GAS REVERSION

Armistead, G., Jr. THE GAS REVERSION AND POLYFORM PROCESSES. *Oil & Gas J.* 45, 189, 191, 195 *(1946) July 27.*

A distinction is made between the terms gas reversion and polyform, in referring to the processes involved. In gas reversion the light hydrocarbons are cracked before being mixed with heavier charge; in polyform operations the light and heavy charges are mixed and heated together in the same zone. Severe gas reversion is applicable especially to the cracking of catalytic cycle oils. Justification for polyform and gas reversion depends largely on local butane and volatility balances; availability of extraneous charge materials is very important in the economics of these processes.

--Author's abstract

5. NATURAL GAS AND NATURAL GAS CONDENSATES

HELIUM AS A TRACER

Frost, E.M., Jr. HELIUM TRACER STUDIES IN THE ELK HILLS, CALIFORNIA, FIELD. *U.S. Bureau Mines R.I. 3897 (1946) June.*

Helium has great value to the oil and gas industry as a tracer gas, according to the tests just completed in the Elk Hills Field, Naval Petroleum Reserve No. 1, Kearn County, California. When used as a tracer gas, small percentages of helium are mixed with natural gas pumped into a reservoir for conservation, repressuring or cycling purposes. Because minute quantities of helium added to natural gases can be detected by analytical methods and accurately determined, the variations of the helium content of gas withdrawn from various parts of a field when helium has been added to the injected gas give interesting and long-sought data on the movement of injected gas through reservoirs. This report discusses the Bureau's work on the problem of determining the direction and extent of migration of injected gas in the Elk Hills reservoir by the use of helium as a tracer gas.

--Excerpt from article

LP GASES FOR BASE LOAD

Boyer, E.G. LP GASES PLANT AND DISTRIBUTION PRACTICE. *Amer. Gas J. 165, 31-35 (1946) July; Am. Gas Assoc. Monthly 28, 315-320,359 (1946) July-August.*

The author discusses the use of LP gases for base load and standby purposes in a system undergoing a rapid increase in house heating load. He mentions reforming, cold enrichment and gas-air mixing as methods of utilizing the LP gases. Various methods of calculating interchangeability are mentioned.

--M.F. Knoy

Note: The author discusses this subject in *Gas Age 97, 15-18,54,56 (1946) June; 98, 31-35,54 (1946) July 11* under the title "Peak and Base Load Gas Production. -Past and Future."

METHANE

Egerton, A., Hall, T.A., Pearce, M. THE PRODUCTION AND STORAGE OF LIQUID METHANE. *Institute of Fuel Bulletin 19, 193-200 (1946) June.*

Results of a 12,500 mile service test of a bus employing liquid methane as a fuel are described. With a compression ratio of 8:1, liquid fuel consumption and power developed compare favorably with gasoline as fuel. Evaporation losses of methane were about 8% with a specially designed storage tank. Large scale storage of liquid methane is also discussed and underground storage is preferred for safety and reduction of heat flow. It is also proposed that extraction of methane and ethylene by liquefaction be employed in coke oven plants. The methane accumulated in summer would be used for enriching blue water gas in winter; ethylene would be sold to the chemical industry. The difficulties are enumerated and the purity of the treated gases is necessarily high due to removal of high freezing point, corrosive and poisonous constituents. Costs of liquefaction are not evaluated.

--C.H. Riesz

5. NATURAL GAS AND NATURAL GAS CONDENSATES

PIPING CARBON DIOXIDE

Voss, W.W. PIPING CARBON DIOXIDE FOR FIRE PROTECTION. *Heating, Piping and Air Conditioning* 18, 73-9 (1946) April; *Butane-Propane News* 8, 85-6 (1946) June.

Quick distribution of liquid carbon dioxide from a large central source of supply under uncommon combinations of pressure and temperature conditions is a vital industrial service in which piping plays an important part. In this article the author describes the layout, installation, specification, testing, etc., for such process piping. The type of piping layout developed for this application has contributed measurably to the reliability of fire protection by means of low-pressure carbon dioxide. Safe and certain fire protection of valuable or hazardous storage or processing relieves much risk and insures against costly loss of equipment, material, and irreplaceable production time--and it saves lives.

PROCESSING GAS CONDENSATES

Dotterweich, F.H. and Bennett, E.O. TRENDS IN PROCESSING GAS CONDENSATE RESERVOIRS. *Gas* 22, 37-40 (1946) July.

Discovery over the period of the past ten years of areas in which the hydrocarbons exist entirely in the vapor phase in the formation, but which when produced will partially condense upon reduction in temperature or pressure, has focused attention upon the economics of recovering gas condensates. Research and experimentation in processing gas condensate reservoirs, including methods used by the Bureau of Mines, is reviewed by the authors.

--Editor's abstract

PROCESSING RICH AND LEAN GAS

SEPARATE PROCESSING FOR RICH AND LEAN GAS. *Petroleum Refiner* 25, 220-222 (1946) May.

The new unit at the Wilmington Gasoline Company's plant at Long Beach with equipment for absorption distillation and stabilizing is the newest gasoline plant in the Los Angeles basin. Additional casinghead gas, obtained by directional drilling beneath the harbor, necessitated the construction of the new unit. Extremely lean gas is now processed through absorbers separately from richer gas so as not to contaminate gas that can be depended upon to release profitable quantities of natural gasoline. Absorption oil is pumped into the absorbers and, after absorption and preheating, to the still for stripping. The condensate and the uncondensed still vapors are cooled and mixed with the overhead condensate and still vapors from the older unit of the plant and pumped to the stabilizer feed tank which also receives the condensate from the recompressor units. This composite feed is then pumped through a stabilizer feed bottom exchanger to the stabilizer for separating the fractions into bottoms and tops, the bottoms being commercial natural gasoline and the tops as feed to the butane column for making commercial grades of LPG. Residue gas from the plant is processed through a diethylene glycol plant to reduce the moisture before entering transmission lines.

--J.J. First

5. NATURAL GAS AND NATURAL GAS CONDENSATES

PROPANE-AIR PRODUCTION

Thomas, H.E. and Peacock, P.E., Jr. IT WILL PAY TO CONVERT TO PROPANE-AIR. *Gas* 22, *32-36 (1946) July.*

It can be demonstrated that the overall costs of gas production for propane-air gas is less than present costs in many water gas plants. Propane may be used as propane-air, undiluted propane vapor or reformed propane. Local conditions will determine whether a gas interchangeable with the present gas supply is desirable. If so, propane-air of the required specific gravity and heating value can be obtained through the use of any one of several makes of mixers. Either low pressure or high pressure mixers are obtainable. A tabulated comparison of production costs for water gas and for propane-air indicate a saving of some 40% in favor of the latter.

--M.F. Knoy

PROPANE UTILIZATION

Bludworth, J.E. CHEMICALS FROM PROPANE. *Natl. Petroleum News* 38, *Tech. Sect. R-531-R-536 (1946) July 3.*

The manufacture of chemicals from propane is discussed briefly. It is emphasized that marketing of chemicals involves careful consideration of the economic factors involved. Thus, the impact of the mass production of new chemicals will affect the existing price structure and market demands. LPG producers are warned that the conversion of propane into chemicals should not be considered as a large consumer of propane and that the improved sales value of LP gases as fuels should be appreciated.

--C.H. Riesz

REACTION OF NATURAL GAS WITH STEAM

Gordon, A.S. UNCATALYZED REACTION OF NATURAL GAS AND STEAM. *Ind. Eng. Chem.* 38, *718-720 (1946) July.*

The uncatalyzed reaction of natural gas with steam has been studied between 1225° and 1516°C. with steam natural gas ratios of 1.5 and 5, and time of contact between 0.21 and 4.6 seconds. Even at high temperatures, long contact times and steam-natural gas ratio of 5 there is some carbonization of the natural gas. The extent of carbonization is shown to be a function of the ratio of steam to natural gas, and to vary erratically with temperature and time of contact. As the temperature is increased, the percentages of natural gas undecomposed in one pass through the furnace become less dependent on contact time (in the range of contact times studied), until at about 1500°C. there is little or no effect. At any temperature the percentage of undecomposed gas shows little if any dependence on the ratio of steam to natural gas.

TRANSMISSION LINES

Adams, G.R. CORRECT SIZING OF NATURAL GAS TRANSMISSION LINES. *Oil Weekly* 122, *64-70 (1946) June 24.*

The minimum thickness of pipe line can be estimated by means of the API code formula for bursting pressure. The following factors are of importance

in selecting the I.D. of the pipe: (1) The smaller the pipe the less the cost of the pipe; (2) The smaller the pipe the greater will be the pressure drop and, therefore, the greater will be compressor costs; (3) If the pipe is too small production will be hindered; (4) Allowance must be made for the fact that in time the gas volume will drop off as the field starts to decline; (5) If the pressure drop is great there is danger of hydrate formation at the inlet end. Some pressure drop curves based on the formula of Weymouth and of Oliphant are given.

--J.D. Parent

UNDERGROUND PIPES

Stirling, J.C. PROTECTING UNDERGROUND PIPE LINES. *Oil Weekly* 122, 64-70 (1946) *June 24.*

The author recommends selecting the pipe thickness in view of the required internal pressure and with a minimum of corrosion allowance. The pipe should be properly coated and periodically tested for coating puncture; cathodic protection is recommended where necessary.

--J.D. Parent

NAPHTHA UPGRADING

Hill, L.R., Vincent, G.A. and Everett, E.F., Jr. HYDROFORMING CATALYTIC METHOD FOR NAPHTHA UPGRADING. *National Petroleum News* 38, *Tech. Sect.* R-456-465 (1946) *June 5.*

Hydroforming is a catalytic process which converts naphthenes (cycloparaffins) by dehydrogenation and paraffins (mainly straight chain) by cyclization into aromatic hydrocarbons. By utilization of a selected fraction of naphtha, toluene was produced during the war. However, the original function of the process was to upgrade (reform) full boiling-range heavy naphthas into motor fuels and technical information on this procedure is presented. The reaction takes place with a molybdena on alumina catalyst at 900-1000°F; 200-300 pounds per square inch gauge pressure is maintained by recycling a hydrogen rich gas formed as a by-product in the process. The reaction proceeds for 5 to 8 hours after which time, the coke deposit (about 1% by weight of charge) on the catalyst must be burned off. High yields of 66-80 octane number product are obtained. Removal of 90% of the sulfur contained in the naphtha feed is an important characteristic of the process which in turn contributes to a high tetraethyl lead susceptibility.

--C.H. Riesz

7. ANALYTICAL METHODS AND TESTS

DETERMINATION OF CARBON DIOXIDE AND HYDROGEN SULFIDE

Blohm, C.L. and Riesenfeld, F.C. SIMULTANEOUS DETERMINATION OF HYDROGEN SULFIDE AND CARBON DIOXIDE IN A CONTINUOUS GAS STREAM. *Ind. Eng. Chem. Anal. Ed.* 18, *373-375 (1946) June.*

A method is described for the simultaneous determination of hydrogen sulfide and carbon dioxide in a continuous stream of natural gas. Standard iodine solution is used to selectively absorb the hydrogen sulfide from the gaseous mixture and is followed by standard barium hydroxide solution for carbon dioxide removal. Test gas is metered through known quantities of the standard solutions until one or the other is exhausted as demonstrated by an indicator change. Upon reaching an endpoint, a meter reading is taken and then a measured volume of fresh solution is added so that the run can be continued. Satisfactory results have been obtained when employing iodine solutions ranging from 0.01 to 0.5 normal and with barium hydroxide solutions from 0.1 to 0.5 normal. Results obtained were compared with analyses made by the Tutiveiler, C.N.G.A., and Orsat methods and found to agree within the limits of experimental error. Successive determination yielded an error not greater than ±2.5%. The method is readily adapted to field testing by means of slight modification.

--H. Hakewill

DETERMINATION OF HELIUM

Frost, E.M., Jr. IMPROVED APPARATUS AND PROCEDURE FOR THE DETERMINATION OF HELIUM IN NATURAL GAS. *U.S. Bureau Mines R.I. 3899 (1946) June.*

A new apparatus for determining the helium content of natural gas is described. The principle of the apparatus is based upon the fact that large volumes of all the constituents usually found in natural gas, except helium, are adsorbed quantitatively on coconut charcoal that has been cooled to the temperature of liquid air. A volume of sample is measured and transferred to a tube of coconut charcoal maintained at the temperature of liquid air. After adsorption of all the constituents other than helium, the charcoal tube is connected to a sensitive pressure-measuring device, and the percentage of helium originally in the sample is calculated from two pressure readings and the volume of the original sample. The advantages of the apparatus are: (1) It enables more rapid determinations to be made; (2) It has far greater sensitivity than previous apparatus; (3) It is portable.

--Excerpt from article

INFRA-RED ANALYSIS

Coggeshall, N.D. and Saier, E.L. ANALYSES OF MIXTURES OF LIGHT GASES BY INFRARED ABSORPTION. *J. Applied Physics* 17, *450-456 (1946) June*

A discussion is given of the application of infra-red absorption methods of analysis for light gases which do not obey Beer's law of absorption due to pressure broadening. Some of these gases do not obey Beer's law in the pure state or when contaminated by foreign gases. The method of analysis depends upon the nature and intensity of the pressure broadening effects of the different components in the sample upon each other. Data are presented showing the nature of some of these effects and illustrating the accuracy obtainable for certain types of analyses. The instrumentation used in

routine gas analyses by infra-red in the laboratory of the Gulf Research and Development Co. is described.

--Author's abstract

PARTICLE SIZE DETERMINATION

Bailey, E.D. PARTICLE SIZE BY SPECTRAL TRANSMISSION. *Ind. Eng. Chem. Anal. Ed.* 18, 365-370 (1946) June.

A simple method has been developed for determining two parameter size distributions from transmissions measured in the visible and near infra-red parts of the spectrum. It is based on an empirical relationship between scattering, particle size, refractive index, and the wave length of light. The method was developed for essentially nonabsorbing materials and was originally based on particle size measurements made with the low-speed Svedberg ultracentrifuge.

--Author's abstract

SPECIFIC SURFACE DETERMINATION

Pechukas, A. and Gage, F.W. RAPID METHOD FOR DETERMINING SPECIFIC SURFACE OF FINE PARTICLES. *Ind. Eng. Chem. Anal. Ed.* 18, 370-373 (1946) June.

The Lea and Nurse method of determining the specific surface of fine powders using gas permeabilities has been modified for measuring particles whose mean diameters are less than 1.0 micron. The problem of turbulence within the porous sample plug which accompanies measurements of finely divided pigments has been overcome by using small-bore, highly compressed plugs. Pressure differentials of 1 atmosphere have been substituted for the lower pressures of Lea and Nurse to overcome the resistance to air flow offered by the more highly compressed plugs. The method is rapid and simple in operation and is reproducible, the specific surface values being fairly constant over a range of porosities. An apparatus suitable for routine work and plant control is described.

--Author's abstract

SULFUR DIOXIDE IN AIR

Thomas, M.D. and Ivie, J.O. AUTOMATIC APPARATUS FOR DETERMINATION OF SMALL CONCENTRATIONS OF SULFUR DIOXIDE IN AIR. *Ind. Eng. Chem. Anal. Ed.* 18, 383-387 (1946) June.

A simple countercurrent absorber is described in which practically complete absorption of the water-soluble gases such as sulfur dioxide, ammonia, and hydrogen chloride may be obtained with gas flow rates ranging from less than 10 to more than 5000 times the liquid rates. This absorber, when used in conjunction with a conductivity flow cell of small volume, gives a rapid recording of the concentration from a few parts per billion to several per cent. With the lower gas concentrations, the record is a running average, covering 1 to 2 minutes. An alternative absorber containing conductivity electrodes can reduce this time to 10 to 15 seconds, but absorption is not complete. A simple pump for delivering small volumes of liquid is also described. Equipment embodying this absorber has been applied to the measurement of atmospheric contamination, to the chemical control of a pilot plant making elemental sulfur from sulfur dioxide, and to the

rapid measurement of sulfur dioxide in flue gases in the presence of carbon dioxide.

--Author's abstract

TAR FOG DETERMINATION

Badger, E.H.M. and Wilson, D.S. THE DETERMINATION OF TAR FOG IN GAS. *J. Soc. Chem. Ind.* 65, 119-21 (1946) *April.*

An impingement method using a slightly modified form of Blackie's apparatus is used for the determination of tar fog in gas. The modified apparatus makes use of a standardized jet of 1/32 in. diameter and a simple ground glass cap with exit tube. Gas rates of from 8 to 10 cu.ft. per hr. have been found to be most convenient; the pressure rate being about 2 in. Hg. A reservoir of 500 ml. capacity is provided in which large tar drops may settle out, allowing only the true tar fog to enter the impinger. To prevent condensation of tar oils it was found necessary to make tests at the temperature of the gas being sampled. The apparatus was therefore thermostated in a suitable container in which was incorporated a 60 watt electric light bulb to furnish the required heat to the apparatus. Results obtained on dry tar fog were easily determined by direct weighing of the impingement vessel. In the case of determinations for wet tar fog, a water vapor correction had to be made. This required taking up the water vapor with benzene and subsequent distillation of the benzene. If considerable water was present most of it could be directly weighed and the balance, that clinging to tube walls etc, then benzene-extracted. Another method for water determination consists of titration after absorption by a special methyl alcohol, pyridine, iodine and sulfur dioxide reagent. Particle size of tar drops was also determined. Those found in tar fog usually are from 1 to 5 microns in size.

--L.H. Mc Ewen

8. GENERAL AND PHYSICAL CHEMISTRY

COMBUSTION OF CARBON MONOXIDE

Arthur, J.R. THE COMBUSTION OF CARBON MONOXIDE. *British Coal Utilisation Research Assoc. Monthly Bull.* 10, *129-134 (1946) May.*

The presence of moisture affects the type of reaction between CO and O_2 so that the author refers to "wet" and "dry" types. In the presence of moisture there is evidence of a chain reaction, and reactions are proposed for this case. It is interesting that the reaction is inhibited by filling the reacting vessel with spheres of the same material, and that the rate of reaction is proportional to the partial pressure of CO and H_2O and inversely proportional to the partial pressure of O_2. There appears to be some of the dry reaction occurring simultaneously. In the absence of moisture a temperature increase of more than 100°C is necessary to get an observable reaction. In this case oxygen does not inhibit and the rate is proportional to the partial pressures of CO and O_2 raised to a power less than one. It is predominantly heterogeneous and there may be some chain reaction.

--J.D. Parent

SORPTION OF OXYGEN ON STEEL

Armbruster, M.H. and Austin, J.B. THE ADSORPTION OF OXYGEN AT LOW TEMPERATURE AND PRESSURE ON SMOOTH IRON. *J. Am. Chem. Soc.* 68, *1347-1354 (1946) July*

The sorption of oxygen on three smooth surfaces of iron (cold-rolled steel), on which the sorption of other gases had also been determined was measured at 20, -78, and -183° and at pressures up to 0.1 cm. Sorption on each surface was observed first after degreasing and outgassing, subsequently on the same sample after it had been reduced in purified hydrogen and again outgassed.

--Excerpt from article

SORPTION OF WATER VAPOR ON STEEL

Armbruster, M.H. THE SORPTION OF WATER VAPOR AT LOW PRESSURE ON THE SURFACE OF SOME COLD-ROLLED STEELS AT 20°. *J. Am. Chem. Soc.* 68, *1342-1347 (1946) July*

The sorption of water vapor at 20° and pressures up to 0.15 cm. has been measured on two surfaces of cold-rolled, mild carbon steel on which the sorption of other gases had previously been measured; also on a stainless alloy containing 18% chromium and 8% nickel. At the highest pressures investigated the carbon steels sorb what is interpreted, by comparison with the amounts of carbon monoxide sorbed reversibly at -183° on the identical surface, as a complete layer held physically and a partial layer by chemisorption. The stainless alloy adsorbed three to four times as much as the carbon steel and of this amount one-third was chemisorbed. The effective surface area of the two carbon steels was significantly different, though the surfaces were nominally the same. The rate of sorption is slow. An amount corresponding approximately to that held physically is taken up within a few minutes, with attainment of equilibrium in half an hour; about 90% of the total sorption occurs within three to four hours, the remainder in an additional fifteen hours.

--Author's abstract

9. ORGANIC CHEMISTRY

CYCLOPROPANE, THERMODYNAMIC PROPERTIES

Ruehrwein, R.A. and Powell, T.M. THE HEAT CAPACITY, VAPOR PRESSURE, HEATS OF FUSION AND VAPORIZATION OF CYCLOPROPANE. ENTROPY AND DENSITY OF THE GAS. *J. Am. Chem. Soc.* 68, *1063-1066 (1946) June.*

The heat capacity of solid and liquid cyclopropane has been measured from 15°K. to the boiling point. The melting and boiling point temperatures were found to be 145.54 and 240.30°K., respectively (0°C.=273.10°K). The heats of fusion and vaporization were determined by calorimetric observation to be 1301 and 4793 cal. mole^{-1}, respectively. The vapor pressure of liquid cyclopropane was measured and the data has been represented by the equation

$$183 \text{ to } 241°K \quad \log_{10} P(\text{inter. cm. Hg}) = 9.03877 - \frac{1348.2}{T} - 0.00823T + 7.45 \times 10^{-6}T^2$$

The density of cyclopropane gas at 298.10°K. and 1 atmosphere was found to be 1.7643 g./liter. The calorimetric data have been used to calculate the entropy of cyclopropane gas and this value has been compared with one obtained from molecular data and it is found that the entropy of cyclopropane approaches zero near the absolute zero of temperature. The most reliable value of the entropy is the one obtained from molecular data, 56.84 cal./degree per mole at 298.10°K. and 1 atmosphere. This value does not include the nuclear spin entropy.

DESTRUCTIVE HYDROGENATION

DESTRUCTIVE HYDROGENATION. *Chem. Met. Eng.* 53, *272 (1946) June.* Digest from "Rates of Decomposition of Hydrocarbons in Destructive Hydrogenation. III" by A.V. Lozovoi and S.A. Senyavin, *Zhurnal Prikladnoi Khimii* 18, *43-9 (1945).*

Effect of structure on the rate of destructive hydrogenation of 10 typical compounds is shown in an attached table, which gives the relative rates of decomposition of hydrocarbons in destructive hydrogenation in the presence of 5% molybdenum sulfide under an initial pressure of 80 atmospheres. Cyclic hydrocarbons without side chains decompose at considerably slower rates than aliphatics. Relative rates of decomposition of molecules having approximately equal numbers of carbon atoms decrease in the following order: normal paraffins, polynuclear naphthenes, partly hydrogenated fused-ring aromatics, fused ring aromatics; in other words, the rate of decomposition varies directly with the proportion of hydrogen in the molecule. Within 380-420° the temperature coefficient of the rate of destructive hydrogenation is 1.85-2.05, the apparent energy of activation 55,000-65,000 cal. per mole. Within 420-475° the corresponding values are 1.6-1.75 and 48,000-58,000.

--Excerpt from article

DIMETHYLBUTANE, THERMODYNAMIC PROPERTIES

Kilpatrick, J.E. and Pitzer, K.S. THE THERMODYNAMICS OF 2,2-DIMETHYLBUTANE, INCLUDING THE HEAT CAPACITY, HEATS OF TRANSITION, FUSION AND VAPORIZATION AND THE ENTROPY. *J. Am. Chem. Soc.* 68, *1066-1072 (1946) June*

The heat capacity of 2,2-dimethylbutane has been measured from 15 to 280°K. and the vapor pressure from 211 to 290°K. The following values were

obtained: heats of transition, 1289.2 ± 3 cal./mole at 126.81°K; 67.7 ± 1 cal./mole at 140.88°K.; heat of fusion 138,5 ± 0.5 cal./mole at 174.16°K.; entropy at 298.16°K., 65.13 ± 0.15 for the liquid and 85.72 ± 0.2 cal./degree mole for the ideal gas.

FISCHER-TROPSCH CATALYST

Hall, C.C. and Smith, S.L. THE LIFE OF A COBALT CATALYST FOR THE SYNTHESIS OF HYDROCARBONS AT ATMOSPHERIC PRESSURE. *J. Soc. Chem. Ind.* 65, *128-136 (1946) May*

The economic operation of a catalytic process on the industrial scale is to a large extent dependent on the period of time for which the catalyst can be maintained in an active condition. From the accounts which have been published concerning the pre-war operation of Fischer-Tropsch plants in Germany, it would appear that this period is about 4 or 5 months for the cobalt catalyst used in the synthesis of hydrocarbons at normal pressure, and the manufacture and recovery of catalyst forms an important and expensive feature of the whole process. The work described in this paper shows that a cobalt catalyst supported on kieselguhr and containing thoria and magnesia as activators can be maintained in a high state of activity for periods of the order of 18 months by intermittent treatment with hydrogen under various conditions.

--Author's abstract

FISCHER-TROPSCH SYNTHESIS

Cotton, E. GERMANY'S FISCHER TROPSCH PROCESS. A SUMMARY OF LATEST DEVELOPMENTS AND OPERATING PROCEDURES. *National Petroleum News* 38, *Tech. Sect. R-425-434 (1946) June 5.*

Technical information on the German Fischer-Tropsch plants, as found by the Technical Oil Mission, is summarized. Synthesis gas for the process was mainly produced in standard water gas sets, the blue water gas being subjected to a catalytic shift process whereby the required ratio of two volumes of hydrogen to one of carbon monoxide was obtained. Methane, reacted either with steam or with oxygen, also was a source of synthesis gas. After removal of hydrogen sulfide from the synthesis gas, organic sulfur was eliminated by means of a 70% iron oxide- 30% sodium carbonate catalyst maintained at 180-280°C.; the sulfur was converted to sulfate by addition of controlled amounts of oxygen. The preparation and reduction of the catalyst is described. The standard catalyst consisted of 100 parts cobalt, 5 parts thoria, 8 parts magnesia and 180-200 parts of kieselguhr. Only cobalt catalyst was used in commercial plants; pilot plant development with iron catalysts, however, gave attractive results. The Normal Pressure procedure operated at 4 pounds per square inch gauge and employed a reactor fitted with plates and cooling tubes. Exothermic heat of reaction was removed by generation of steam in the tubes; temperature control was set by fixing the steam pressure. Generally, the process took place in two stages. The Medium Pressure synthesis operated with the reactor in three stages at about 150 pounds per square inch gauge. The reactor consisted of annular tubes which supplied cooling water both inside and outside of the catalyst placed in the annular space. Other methods of removing the exothermic heat of synthesis were investigated in pilot units,

namely, hot gas recycle, oil recirculation and oil suspended catalyst. The fluidized catalyst technique apparently had not been tried in Germany.

--C.H. Riesz

MONOOLEFINS, THERMODYNAMIC PROPERTIES

Kilpatrick, J.E., Prosen, E.J., Pitzer, K.S., and Rossini, F.D. HEATS, EQUILIBRIUM CONSTANTS, AND FREE ENERGIES OF FORMATION OF THE MONOOLEFIN HYDROCARBON. *J. Research Natl. Bureau Standards* 36, *559-612 (1946) June.*

For ethylene, propylene, each of the four butenes, six pentenes, and 17 hexenes, and for the higher normal 1-alkenes, values are presented for the following thermodynamic properties to 1,000° or 1,500°K: The heat of formation from the elements, $\Delta HF°$; the free energy of formation from the elements, $\Delta Hf°$; and the logarithm of the equilibrium constant of formation from the elements, $\log_{10}Kf$. For each of the 6 pentenes and 17 hexenes, values are also given to 1,000° or 1,500°K, for the following properties: The heat-content function, $(H°-H_o°)/T$; the free energy function $(F°-H_o°)/T$; the entropy, S°; the heat content, $H°-H_o°$; and the heat capacity, $C_p°$. Equilibrium constants and concentrations are given in tabular and graphical form for the isomerization of the 4 butenes, 6 pentenes, and 17 hexenes, as a function of the temperature to 1,000° or 1,500°K. Equilibrium constants are also given in tabular and graphical form for some reactions of hydrogenation, dimerization, and alkylation.

--Author's abstract

PROPANE-DICHLORODIFLUOROMETHANE INFLAMMABILITY

Jones, G.W. and Scott, F.E. EXTINCTION OF PROPANE AND BUTANE FLAMES BY DICHLORODIFLUOROMETHANE. *U.S. Bureau of Mines R.I. 3908 (1946) June.*

The results presented in this report relative to the inflammability of propane-dichlorodifluoromethane and butane-dichlorodifluoromethane mixtures indicate that liquid dichlorodifluoromethane can be diluted with either liquid propane, butane, or mixtures of the two to the point where the final mixtures contain 25 per cent (liquid volume) of the hydrocarbon or hydrocarbons without creating hazards of inflammability when the mixtures are sprayed or atomized into air at normal temperatures and pressures.

--Excerpt from article

10. CHEMICAL ENGINEERING

AIR CONDITIONING THERMODYNAMICS

Palmatier, E.P. THERMODYNAMICS FOR THE AIR CONDITIONING ENGINEER. *Heating & Ventilating* 43, 66-72 (1946) July.

The subject of thermodynamics as it applies to air conditioning engineering is covered in two sections. Part I covers basic principles; Part 2, on applications and psychrometry, to follow. Subjects covered in Part I include equivalence of various types of mechanical energy; meaning of internal energy and its relation to work and heat; the fact that specific heat depends on the type of process involved; meaning of enthalpy; important characteristics of ideal gases; mixture of ideal gases; and reversibility.

CYCLONE PERFORMANCE

Briggs, L.W. EFFECT OF DUST CONCENTRATION ON CYCLONE PERFORMANCE. *Trans. Am. Inst. Chem. Engrs.* 42, 511-526 (1946) June 25.

The dispersion of dust in an air stream passing through a cyclone, decreases the pressure drop across the cyclone. Using a nine-inch cyclone of the multiclone vane type, the fractional decrease in the pressure drop, for a given rate of flow, has been found to vary as the square root of the dust concentration. To calculate the volume of air passing through a cyclone from pressure drop values, measured when dust loadings are relatively high, a correction factor must be applied to the pressure drop values. Collection efficiencies of a cyclone have been determined for concentrations of the test dust, which vary from .5 to 100 grains per cubic foot. The effect of dust concentration upon collection efficiency has been shown to be small but not to be neglected for accurate work.

--Author's abstract

EQUILIBRIUM WATER VAPOR

Hammerschmidt, E.G. EQUILIBRIUM WATER VAPOR CONTENT OF COMPRESSED GASES. *Gas Age* 97, 24-25 (1946) June 27.

The author claims that it is impossible to calculate saturation moisture contents of compressed gases accurately. An effort was made to correlate published data, and to provide a chart which shows how the saturation moisture content varies with both temperature and pressure. Such was done, and in view of the observed magnitude of the inconsistencies in the data the author suggests that the resulting graph is good enough for air and all natural gases to within about two or three per cent.

--J.D. Parent

GAS HYDRATES

Frost, E.M., Jr. and Deaton, W.M. GAS HYDRATE COMPOSITION AND EQUILIBRIUM DATA. *Oil Gas J.* 45, 170-173, 177-178 (1946) July 27.

This report presents data on the composition of the gas hydrate molecule of several pure gases and presents pressure-temperature equilibrium data for several pure gases at temperatures below 32°F. The hydrate composition was obtained by direct measurement of the gas and the water resulting from the decomposition of hydrates. The composition also was calculated from

the pressure-temperature equilibrium data. The compositions obtained by direct measurement and by calculations are in close agreement.

--Author's abstract

SPECIFIC DISPERSION OF HYDROCARBONS

Lipkin, M.R. and Martin, C.C. CALCULATION OF SPECIFIC DISPERSION OF PURE HYDROCARBONS AND PETROLEUM FRACTIONS. *Ind. Eng. Chem. Anal. Ed.* 18, 433-436 (1946) *July.*

An equation is presented for the calculation of specific dispersion of pure hydrocarbons and petroleum fractions from common physical properties, density, refractive index, and approximate molecular weight, which can be estimated from mid-boiling point and density or viscosities at 100° and 210°F. This makes it possible to obtain specific dispersion on a highly colored sample or in a laboratory where no instrument is available for the direct measurement of dispersion. The accuracy of the calculated specific dispersion for petroleum fractions is comparable with the accuracy of measurements obtained on the Abbe instrument, ± 3 units.

--Author's abstract

SUPERHEATED STEAM FLOW

SUPERSATURATED STEAM FLOW. *Power* 90, 134 (1946) *July.*

Curves given apply to steam flow through well-rounded orifices, flow nozzles and turbine and ejector nozzles. They are based on the supersaturation theory advanced by Aitkens, Wilson and Stodola (Power, Oct 4, 1927, p 511.) Flow calculations based on equilibrium conditions for steam expanding from a dry to a wet state yield flow rates 3 to 5% less than actual. Equilibrium conditions assume that a steam expands into a wet saturated state it condenses in conformance with usual saturation temperature and pressure relations. However, because of expansion rapidity, steam momentarily cools below temperature corresponding to saturation pressure with less than normal moisture forming. While this unstable condition prevails for only a very short time during flow, it exists long enough to increase flow rate above equilibrium expectations. This chart takes this phenomenon into account and applies to conditions where exhaust pressure equals or is less than about 55% of initial steam pressure.

--Excerpt from article

II. PROCESS EQUIPMENT AND INSTRUMENTATION

BLENDING APPARATUS

Busey, R.H., Barthauer, G.L. and Metler, A.V. PREPARATION OF SYNTHETIC SAMPLES OF LOW-BOILING HYDROCARBONS. *Ind. Eng. Chem. Anal. Ed.* 18, 407-411 (1946) July.

The design and operation of an apparatus for the blending of low-boiling hydrocarbons are described. The apparatus is so designed that standard samples containing any number of components may be prepared rapidly, in any size, and with a degree of accuracy far superior to present methods of analysis. The apparatus has been thoroughly tested. Data are presented for samples in the butane and pentane range.

--Author's abstract

HEAT GENERATING APPARATUS

Lamport, E.J. (to Lamport Hydro-Oil Furnace Company, Inc.) HEAT GENERATING APPARATUS AND PROCESS. U.S. 2,403,446 (1946) July 9.

A heat generator comprising a combustion chamber, a nozzle for directing combustible fuel into said chamber, a fuel oil supply line connected to said nozzle, a cracking coil inserted in said oil supply line, a water supply, a steam generator within said chamber, a gas dispersion device within the cracking coil supplying heated gases directly to said coil, connecting conduits between the water supply, steam generator and gas dispersion device, and an enclosing imperforate casing without the coil, said device comprising a perforated casing within said coil.

OXYGEN PRODUCTION UNIT

Lobo, W.E. OXYGEN BY FRACTIONATION AT LOW PRESSURES. *Chemical Industries* 61, 53-56 (1946) *July.*

A unit for the production of oxygen by the fractionation of liquid air at relatively low pressure is described. The unit, designated as M-7, is a light weight, self-contained, mobile unit with an output of 1000 scfh of 99.5% purity, dry, gaseous oxygen at 2200 lb. per sq. in. gage pressure from air at an ambient temperature as high as 120°F and a dew point as high as 90°F. Simplicity of operation, the use of a maximum pressure of 100 lb. per sq. in. gage pressure and the complete removal of CO_2 and water from the inlet air by a unique non-chemical method are stated to be the major improvements. Successful development of the following equipment was required: (1) a light weight air compressor and driver; (2) an efficient air-purifying heat exchange equipment; (3) an efficient low temperature expansion engine; (4) a small efficient fractionating column; (5) a dry oxygen compressor. The compressor was a six cylinder, two stage unit designed by Clark Brothers, and delivered air at 100 lb. per sq. in. gage. An entrainment separator and oil filter were provided for the compressed gas. The refrigeration system is a three-annulus, three fluid, reversing heat exchanger in which the incoming air is cooled with the oxygen product and waste nitrogen. The action of the reversing valve caused air and waste nitrogen to be diverted periodically from one of two passages to the other so that the waste nitrogen always flows, in one part of the cycle, through a passage which carried feed air during the previous part of the cycle. This operation removes CO_2 and water from the air by alternate freezing out and evaporation into the waste gas. The fractionating column is a single unit fed with vapor. There are six plates in the rectifying section and

24 in the stripping section. The spacing is two inches; the O.D. is 12 inches. In the reboiler air condenses within the tubes at -277°F reboiling liquid oxygen at -285°F on the outside. The pressure on the column is substantially that of the discharge side of the reciprocating expander, 11 lb. per sq. in. gage. Oxygen leaving the tower passes directly through a given annulus of the reversing heat exchanger continuously.

--J.D. Parent

12. MATERIALS OF CONSTRUCTION

CORROSION-RESISTANT ALLOYS

CORROSION-RESISTANT ALLOYS. *Steel* 119, 70-75, 112 *(1946) July 29.*

Alloys, designated as Hastelloy alloys A, B, C, and D were developed by Haynes Stellite Co. in conjunction with Union Carbide and Carbon Research Laboratories, Inc., to withstand the strong corrosive conditions encountered in the chemical and process industries. These alloys have found application in concentrating equipment, condensers, etching equipment, fractionating columns, valves, and vessels of all kinds in the steel, oil and coal, plastics, rubber, and other industries. Physical and machining properties are given.

CORROSION RESISTANT MATERIAL

Weber, G. PLASTIC TANK COATINGS RESIST SOUR WEST TEXAS CRUDE CORROSION. *Oil & Gas J.* 45, *89-90 (1946) June 29.*

Successful protection against corrosion by sour crude gas and salt water has been obtained through use of a plastic coating employed on the interior of oil tanks in West Texas. Results of a 2-year trial of the material under extreme corrosive conditions indicate that it may prove a long-term solution to many field-corrosion problems now confronting producers. The liquid type, chemically inert thermoplastic resin, termed Resoweld, is a wartime product developed by Goodyear Tire & Rubber Co. It has been adapted to oil field use by French Tool & Supply Co. of Odessa, Texas. To date, its principal use in the oil industry has been in lining all types of oil tanks, but further employment in pipe lines and flowing wells is being investigated and tested with the cooperation of several major oil companies and independent operators.

--Excerpt from article

HEAT TRANSFER APPARATUS

REFRACTORIES AND INSULATION. THE PEBBLE HEATER--A NEW TYPE OF REFRACTORY HEAT TRANSFER APPARATUS. *Industrial Heating* 13, *1190-1196 (1946) July.*

A new type of refractory heat-transfer apparatus for heating gases in such applications, for example, as preheating combustion air, was described at the recent annual meeting of the American Ceramic Society, in Buffalo, N.Y. The new apparatus is a moving bed furnace capable of heating gases, such as air and steam, to temperatures above those obtainable in a metallic heater. The heated-gas output is continuous, with non-fluctuating outlet temperatures. Essentially, the basic design of the new heater consists of upper and lower chamber sections, connected by a throat. The throat serves to help equalize pressures in the two chambers. Surrounding the upper section are the inlets for hot gases that heat the pebbles (with which both sections are filled), to a high temperature. The top of this section is connected to the stack. The lower section, into which the heated pebbles continuously pass through the throat, has an inlet for cold gas and an outlet for gas heated by passing through the descending bed of hot pebbles. Pebbles are continuously discharged from the bottom of the lower section, and are then elevated by a conveyor back to the top section, for recycling. Rate of flow of pebbles through the heater can be controlled. Gases for heating the pebbles in the upper section may be produced in a

combustion chamber surrounding the section, or may be the hot products of combustion from the heating apparatus for which the pebble heater is preheating air for combustion.

SILICONES

Collings, W.R. SILICONES AS NEW ENGINEERING MATERIALS. *Trans. Am. Inst. Chem. Eng.* 42, 455-471 (1946) *June 25.*

Silicones, organo-silicon polymers, have practical significance as engineering materials. Five types of products are being manufactured from the silicones: fluids for hydraulic and other uses; lubricants and greases; sealing compounds mainly for electrical application; resins for laminating and for temperature resistant varnishes and paint; and silicone rubber.

PERIODICALS ABSTRACTED FOR GAS ABSTRACTS

AMERICAN GAS ASSOCIATION MONTHLY

AMERICAN GAS JOURNAL

AMERICAN PETROLEUM INSTITUTE QUARTERLY

AMERICAN SOCIETY FOR TESTING MATERIALS BULLETIN

AMERICAN SCIENTIST

BERICHTE DER DEUTSCHEN CHEMISCHEN GESELLSCHAFT

BITUMINOUS COAL RESEARCH

BLAST FURNACE AND STEEL PLANT

BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS: SECTIONS A AND B

BRITISH COAL UTILISATION RESEARCH ASSOCIATION MONTHLY BULLETIN

BULLETIN AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS

BULLETIN AMERICAN CERAMIC SOCIETY

BUTANE-PROPANE NEWS

CALIFORNIA OIL WORLD

CANADIAN CHEMISTRY AND PROCESS INDUSTRIES

CANADIAN JOURNAL OF RESEARCH: SECTIONS A AND B

CERAMIC ABSTRACTS

CHEMICAL ABSTRACTS

CHEMICAL AND ENGINEERING NEWS

CHEMICAL AND METALLURGICAL ENGINEERING

CHEMICAL INDUSTRIES

CHEMICAL PREVIEW

CHEMISTRY AND INDUSTRY

COKE AND SMOKELESS FUEL AGE

COMBUSTION

COMPRESSED AIR MAGAZINE

DIE CHEMIE

ENGINEERS' DIGEST

FUEL IN SCIENCE AND PRACTICE

GAS

GAS AGE

GAS AND OIL POWER

GAS APPLIANCE MERCHANDISING

GAS JOURNAL

GAS NEWS

GAS TIMES

GAS WORLD

GREAT BRITAIN FUEL RESEARCH INTELLIGENCE STATION ABSTRACTS

HEATING AND VENTILATING

INDUSTRIAL AND ENGINEERING CHEMISTRY: ANALYTICAL EDITION

INDUSTRIAL AND ENGINEERING CHEMISTRY: INDUSTRIAL EDITION

INDUSTRIAL GAS

INDUSTRIAL HEATING

INSTITUTION OF GAS ENGINEERS: BULLETINS, COMMUNICATIONS AND TRANSACTIONS

INSTRUMENTS

IRON AGE

JOURNAL OF THE AMERICAN SOCIETY

JOURNAL OF THE AMERICAN CHEMICAL SOCIETY

JOURNAL OF APPLIED MECHANICS

JOURNAL OF APPLIED PHYSICS

JOURNAL OF CHEMICAL EDUCATION

JOURNAL OF CHEMICAL PHYSICS

JOURNAL OF CHEMICAL SOCIETY (LONDON)

JOURNAL OF THE INSTITUTE OF FUEL

JOURNAL OF THE INSTITUTE OF PETROLEUM

JOURNAL OF ORGANIC CHEMISTRY

JOURNAL OF PHYSICAL CHEMISTRY

JOURNAL OF RESEARCH OF THE NATIONAL BUREAU OF STANDARDS

JOURNAL OF THE SOCIETY OF CHEMICAL INDUSTRY

LP GAS

MATERIALS AND METHODS (METALS AND ALLOYS)

MECHANICAL ENGINEERING

MINING AND METALLURGY

MINING TECHNOLOGY

NATIONAL GAS BULLETIN OF AUSTRALIA

NATIONAL PETROLEUM NEWS

OEL UND KOHLE

OFFICIAL GAZETTE OF THE U.S. PATENT OFFICE

OIL AND GAS JOURNAL

OIL WEEKLY

PETROLEUM

PETROLEUM ENGINEER

PETROLEUM REFINER

PETROLEUM TECHNOLOGY

POWER

POWER PLANT ENGINEERING

PUBLIC UTILITIES FORTNIGHTLY

REFRIGERATING ENGINEERING

SCIENCE ABSTRACTS: SECTIONS A AND B

SOUTHERN POWER AND INDUSTRY

STEEL

TRANSACTIONS AMERICAN INSTITUTE OF CHEMICAL ENGINEERS

TRANSACTIONS AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

TRANSACTIONS AMERICAN SOCIETY OF MECHANICAL ENGINEERS

U.S. BUREAU OF MINES BULLETINS, INFORMATION CIRCULARS, REPORTS OF INVESTIGATIONS AND TECHNICAL PAPERS

WORLD PETROLEUM